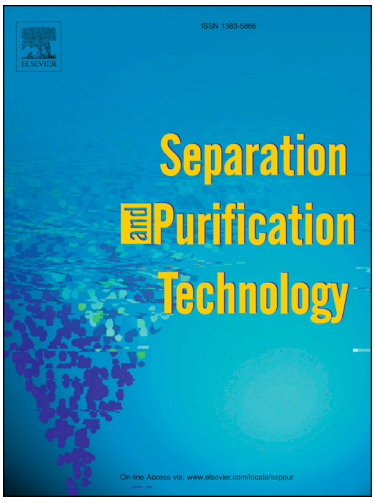

A study on carbon dioxide removal by blending the ionic liquid in membrane synthesis

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A study on carbon dioxide removal by blending the ionic liquid in membrane synthesis

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Abstract:

The attention in ionic liquids (IL) is driven by its distinctive properties, such as negligible vapour pressure, thermal stability, and tunability of properties. To further grow its application in the separation field, the ionic liquid membranes (ILMs) and its separation technology have been proposed and developed rapidly. This paper presents details of recent research involving the blending of ionic liquid in membrane synthesis for Carbon Dioxide (CO_2) removal from Methane (CH_4). The low CO_2/CH_4 separation factor through commercialized membranes is due to the lack of CO_2 affinity towards the polymeric membranes and the presence of interfacial voids in the mixed matrix membranes (MMM). The main objective is to study the influence of ionic liquid (IL) addition into the polymer and polymer-inorganic filler towards the membrane properties and performances. This was achieved by blending different concentrations of ILs at a fixed polyethersulfone (PES) and PES-SAPO-34 composition. The membranes were synthesized using dry-phase inversion technique to prevent the voids formation. The synthesized membranes were physico-chemically characterized and the performances of these membranes were evaluated in term of permeance and selectivity. The synthesized membranes were found to have dense and voids-free structure with lower polymer decomposition temperature (~410^{o}C) as compared with pure PES membrane. The presence of ILs in the membranes had significantly increased the permeance of CO_2 due to enhanced affinity effect. However, the permeance of CH_4 is at the reverse trend due to less CH_4 pathway within the membranes. Experimental results showed that both ILs have significant improvement on the ideal selectivity of the synthesized membranes. This significant improvement indicated that ionic liquid is worth to be explored as an alternative material to enhance the CO_2 affinity in membranes for CO_2 separation from CO_2/CH_4 mixture.

Keyword: ionic liquid membrane blending, carbon dioxide removal, membrane separations, CO_2 affinity